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ABSTRACT

This paper reviews current literature concerning the development of children's comprehension of the processes of natural languages and it recommends a new study approach designed to evaluate the joint effects of lexical and syntactic devices on comprehension. It discusses three main kinds of investigations--studies of the comprehension of individual words and suprasegmentals, studies of information gain, and studies of the comprehension of syntactic processes--as well as testing techniques and the specific syntactic and morphological processes considered. Results of particular studies are given. The second part of the paper covers the necessity of treating language as a structure rather than as individual words when testing comprehension, and it recommends a conceptual-category approach which considers the relationship between formal linguistic processes and cognitive relations by showing how well language is comprehended in specific language-use situations. (VM)

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Children's Comprehension of Natural Language

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CHILDREN'S COMPREHENSION OF NATURAL LANGUAGE[1]

Graeme Kennedy[2]

ABSTRACT

A literature review of children's comprehension of natural language is made according to: the comprehension of individual words and suprasegmentals; information gain; and the comprehension of syntactic processes. The conceptual category approach to the study of comprehension based on the work of Carroll, Neisser, Katz & Foder, and others is outlined. It is concluded that any methodological approach to language comprehension that treats lexical and syntactic factors in isolation rather than as parts of a unitary system expressing conceptual organization will tend to yield findings having only limited generalizability.

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[1]This literature review was done while the author was a Graduate Associate at SWRL during Summer, 1969. In slightly modified form, it appears as Chapters II and III of a doctoral dissertation: Kennedy, Graeme D. "Children's Comprehension of English Sentences Comparing Quantities of Discrete Objects." UCLA, 1970.

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CHILDREN'S COMPREHENSION OF NATURAL LANGUAGE

There have been two main approaches to the study of meaning and comprehension. These have been called the "analytic" and "process" approaches by Ervin-Tripp and Slobin (1966). While the two approaches do make contact at times, the former may be characterized as being concerned particularly with connotative meaning, while the latter has dealt with denotative meaning. The vast literature on verbal learning, association, and mediation is characteristic of the analytic approach. Researchers using this approach to meaning and comprehension have been especially concerned with the behavior of the organism in relation to sign and significate. Linguistic philosophers and grammarians, on the other hand, have been concerned primarily with denotative meaning, and particularly with the relationship between sign and significate.

The experimental investigation of connotative meaning has been extensively reviewed by Creelman (1966) and others. Not surprisingly, there have been numerous investigations in this tradition with children. For example, studies by Brown and Berko (1960), Ervin-Tripp (1961) and Entwisle et al., (1964) have demonstrated that there is a developmental change from syntagmatic to paradigmatic word associations around the seventh year of life. It has been postulated that this change is a reflection of the child's gradual organization of his lexicon into grammatical classes.

Entwisle (1968) has gone further and used the measure of frequency of paradigmatic associations as a basis for comparing subcultural differences in children's language. In no way, however, would this seem to tap the child's knowledge of the base and transformational rules of syntax, or of the rules and features of the semantic and phonological components which linguists consider constitute human linguistic competence.

The investigation of association networks by Deese (1962; 1966), Kiss (1968), and Rotberg (1968) are more highly sophisticated attempts to characterize the matrices of associations of various word-concept categories and may prove to be highly revealing for the study of children's comprehension when further studies are conducted with children. Further variations on the word association approach to meaning and comprehension have included measurement of the number of associations (Noble, 1952) and the latency of the first association (Schlosberg and Heineman, 1950). The frequency of occurrence of words or word segments has been considered as a possible basis for meaningfulness (cf, Underwood and Schulz, 1960), while others have sought to find an index of meaningfulness in the galvanic skin response.

Probably the most extreme of the analytic approaches to comprehension, and the one which most clearly reflects connotative rather

than denotative meaning, is the semantic differential (Osgood, 1952; Osgood, et al., 1957) which has been widely used to describe the connotative meaning of individual nouns in terms of three factors--evaluation, activity, and potency. DiVesta (1966) has shown that this measure can be used with children as young as 7 years of age, and norms have been supplied for children over that age. Methodological problems associated with rating meaning on such bipolar dimensions have made the semantic differential unsuitable for use with children during the period of most rapid language development, the preschool years.

While the kinds of analytic approaches to meaning and language comprehension outlined above have produced consistent results of high generality, and while it seems clear that these models and investigations have significance for our understanding of human semantic behavior, the interpretation of these results in relation to children's comprehension of natural language is not at all clear. This is partly because these investigations have not dealt directly with language as a system, but rather as individual words (usually nouns and verbs). Yet one of the most important characteristics of human language is that it is not merely the sum of its parts, for comprehension of sentences requires knowledge not only of lexicon but also of the language structure.

In addition, research on verbal learning and association has generally been interpreted within the frameworks of single stage or mediational S-R theories inimical to current theories of natural language acquisition and use. The implausibility of such interpretations has been discussed by Chomsky (1959) and others.

Analytic approaches to the study of comprehension are not discussed further in this review. Rather, the literature on the development of children's comprehension of the processes of natural language is reviewed. Particular attention is given to approaches and methodologies used in investigating the development of the comprehension of denotative meaning, and to specific findings of these investigations, especially in the comprehension of syntax.

The Development of Children's Comprehension of Natural Language

There have been many observational studies of the development of language in children as revealed by the child's speech production. There have also been many attempts to formalize language development in terms of grammars outlining the child's knowledge of his language at various developmental levels. Theories of the nature and processes of language development have been drawn from this mass of observational data. Until recently, it has generally beem assumed that if a child can produce certain syntactic structures and morphemes then he "knows"

them, and can thus comprehend them when others use them. In fact, many psycholinguists go further and suggest that children understand more than they produce. It has certainly been a common assumption that the child "knows" his language by the time he goes to school. Thus Carroll (1960, p. 338) wrote,

> By the age of about 6, the average child has mastered nearly all the phonemic distinctions of his language and practically all its common grammatical forms and constructions--at least those used by the adults and older children in his environment. After the age of 6, there is relatively little in the grammar or syntax of the language that the average child needs to learn (except to learn a school-imposed standard of speech or writing to which he may not be accustomed in his home environment). Vocabulary learning, however, continues until late in adult life.

Such a view as Carroll's might appear to be reasonable, but unfortunately, it is not substantiated by hard data or scholarly investigation. As Bellugi-Klima (1968, p. 3) has noted, "The common observation that children understand much more than they produce is made almost invariably without examining the limits of this understanding closely." It is obvious, however, that it is of considerable educational significance to know how, and particularly, when, a normal child becomes able to comprehend various linguistic devices, and the extent of such comprehension.

There have, of course, been studies of the comprehension of natural language, and these have tended to be of three main kinds--studies of the comprehension of individual words and suprasegmentals, studies of information gain, and studies of the comprehension of syntactic processes. We shall examine each of these in turn.

Studies of the Comprehension of Individual Words and Suprasegmentals

The early studies of language development paid careful attention to the initial indications that an infant reacted to language differently from other environmental noise. Table 1 summarizes the findings of McCarthy's (1954, Table 1, p. 499-502) survey of eight major studies of development, with the results relating to the beginnings of comprehension.

TABLE 1

AGE IN MONTHS AT WHICH SOME OBSERVERS HAVE FIRST NOTED INDICATIONS OF LANGUAGE COMPREHENSION

1.3	Responds to human voice
6.0	Distinguishes between friendly and angry talking
8.5	Listens to familiar words
9.0	Responds to "bye-bye"
9.8	Differentiates words
11.5	Inhibits on command
12.0	Comprehends simple verbal commissions
13-23	Understands simple commands (Give me that; Sit down)
16-20	Understands a prohibition or forbidding
18.0	Comprehends simple questions
23-24	Identifies 4 objects by name
24.0	Points to 5 objects on a card
	Points to 7 out of 10 simple pictures
	Distinguishes <u>in</u> and <u>under</u>

Clearly, however, many of these early reported indices of development are poorly defined and do little more than indicate that by the age of 2 years, the normal child can show that he responds to certain individual words and the suprasegmental features associated with prohibitions, questions, and commands.

More recent studies in carefully designed experiments have refined our understanding of this early phase of language comprehension development. In a conditioning study by Fradkinov, reported by Slobin (1966b, p. 367), it was found that up to the age of 8 months, words were no easier to condition the child with than were other sounds, yet by 11 months, four times less reinforcement was required to achieve conditioned responses to words compared with other sounds.

A recent study by Friedlander (1968) provides further evidence that it is the suprasegmentals which form the earliest basis for developing comprehension. Infant boys aged from 11 to 15 months showed a significant preference for the mother's brightly-inflected voice when compared with organ music. They also preferred a brightly-inflected female stranger's voice to their mothers' monotonous voice. This last finding was not replicated with a 15-month-old child who demonstrated a preference for the mother's voice even when it was disguised in an impersonal "flat" tone. Friedlander also observed that with a child of 12 months there was a marked tendency to show preference for incongruous (disguised) samples of the mother's voice rather than normal samples of the same voice and for low redundancy rather than high redundancy

samples of adult conversation. This finding suggests that infants have a very early preference for linguistic variation as part of a need to experience a wide range of primary linguistic data from which to induce the rules of language, and is consistent with the psychological literature showing infants' preference for novelty in their stimuli.

In general, however, as Fraser et al., (1963) have noted, most of the early studies focussed particularly on the beginnings of children's comprehension of content words, especially nouns and adjectives. This concentration on the comprehension of word labels and concepts rather than the structure of language has also been a characteristic of Soviet studies of the developmental of comprehension (Slobin, 1966b; Ervin-Tripp & Slobin, 1966).

Studies of Information Gain

Studies of comprehension as information gain have been reviewed by Mosberg and Shima (1969) who found that few of these studies have been with children and almost invariably only a written stimulus was used. In addition to methodological problems associated with measuring information gain, this approach does not come to terms with the processes which carry the information from one person to the other. In short, use of information gain as the dependent variable is such a gross measure that it precludes interpretation of the factors in the language processes affecting comprehension.

A promising variation on the gross approach can be seen in a series of studies carried out on the "coding abilities" or "communication abilities" of children. Children, visually separated from each other by a screen, were required to give each other instructions to help identify novel forms from an array of possible forms. Glucksberg et al., (1966), for example, found that children aged from 52 to 63 months were unable to communicate with each other about novel forms, although they could do so with familiar objects (pictures of animals). Children aged from 46 to 63 months, however, could identify the novel forms if an adult provided the descriptions. This effect could be accounted for by Piaget's (1926) characterization of young children's speech as being egocentric. The child could not take account of his hearer's ignorance. In the Glucksberg study, the children were able to comprehend apparently complex sentences produced by an adult, such as: "It looks like two worms or snakes looking at each other. The bottom part looks like a rocker from a rocking chair. It's a zigzag with lines going in all different directions." Although this approach can show whether or not comprehension of spoken language has occurred, it does not show whether the child successfully identified the referent on the basis of a single word or by means of the sentence as a whole. Heider et al., (1968) and Krauss and Rotter (1968) have recently used the procedure for investigating "communication ability" across social

classes. Because in their particular studies the encoding ability of the speaker and the decoding ability of the hearer are being tested at the same time, these experiments are not simply tests of comprehension. It does seem likely, however, that this approach holds considerable promise for the investigation of the comprehension of the linguistic processes involved in comprehension, particularly if the sentences used in the communication task are carefully controlled.

Studies of the Comprehension of Syntactic Processes

In spite of the upsurge of interest in the centrality of the syntactic component of language in the last decade, surprisingly little is known about the development of the child's comprehension of syntax. While there has clearly been a shift away from studies of individual word comprehension and sentence length as indices of language development, most of the work in developmental psycholinguistics has been in observational studies of the development of children's grammars. Large corpuses of children's utterances have been collected and grammars written of them. An important outcome of these studies has been to lend weight to new generative theories of language acquisition and the nature of language learning. It has generally been assumed that "comprehension... appears in advance of production" (Brown & Hanlon, 1968) and that production can be taken as evidence of comprehension.

In recent years, however, some prominent psycholinguists have called for a closer look at and more experimental studies of the development of language comprehension to supplement the observational studies. Carroll (1960), Ervin-Tripp (1966), Ervin-Tripp and Slobin (1966) and Slobin (1968) have all emphasized the paucity of our knowledge of the comprehension of syntax. Slobin (1968, p. 47) notes that "with the exception of a few recent experiments performed in the U.S....careful study of speech comprehension has simply not been carried out in the West." As was noted above, even the Soviet studies have tended to concentrate on the comprehension of individual words and simple verbal instructions rather than on grammar.

Some indication of the confused state of our present understanding of the development and extent of children's comprehension can be gauged by the kinds of claims made by prominent linguists and psycholinguists. Chomsky (1964), for example, argued that a child typically commands a much fuller grammar than his speech reveals, and this grammar is employed in his comprehension. Braine (in press) has taken a diametrically opposite position (on this and other issues) and claims that none of the empirical evidence suggests that there is a large difference between sentence comprehension and production "insofar as the control of grammar is concerned," and thus no validity in the position of Chomsky that a child "knows" grammatical rules for which there is no evidence in his speech. Some, (e.g., Menyuk, 1969, p. 154 ff.) have taken an intermediate

position and suggested that although "the data are almost totally lacking," production may not lag far behind the comprehension of syntax, while others (e.g., Slobin, 1968) have suggested that not enough is known to take any position.

Weksel (1965, p. 701) has made what is probably the strongest case for more experimental studies of comprehension to shed light on the opinions outlined above. He concluded that, "The grammar-writing approach [of Brown & Fraser; Miller & Ervin]...is limited...by the fact that one cannot determine by an observation of his recorded output, what the child does in fact know about language structure." For example, as Weksel has noted, although young children employ a form of speech sometimes called "telegraphese," omitting many function words, "the ability to understand function words is a prerequisite to the comprehension of a vast number of sentences." This observation has recently received support from Shipley et al., (1969) who found that young children producing telegraphese did indeed respond better to adult sentences including function words, than to telegraphese of the kind they produce themselves. The authors reached the strong conclusion (p. 337) that "in no sense can recent descriptions of children's speech--no matter how closely the format of these descriptions conforms to transformational accounts--be taken as grammars of child language."

Such an apparent lack of agreement on the development of the comprehension of syntax and on the nature of the comprehension processes clearly calls for the initiation of a whole body of research.

Methodologies Used in Studying the Comprehension of Syntax

General methodological problems. It is no simple matter to test comprehension of any aspect of language, particularly with young children, and at the same time to be sure that it is the device being investigated that is producing the effect. This point has to be kept in mind when various methodological approaches are considered. Developmental studies of the comprehension of syntax have had two main directions As the present review of the literature indicates, some studies have been conducted to show that children can understand certain syntactic devices at a much earlier age than previously assumed, while others have set out to show that certain devices are not comprehended by children of a particular age, or are difficult to comprehend. This latter orientation brings with it the possibility that it is the testing situation or the task requirements rather than the syntax which poses the problem. Further, performance factors such as perception, attention, strain on short term memory capacity as a result of sentence length, and maybe even reluctance to respond can also misleadingly indicate lack of comprehension of a particular syntactic device. The impaired performance of children from lower socioeconomic status homes on tasks requiring responses to pictures rather than real objects (Sigel & McBane, 1966) and the influence of dialect on comprehension (Baratz, 1968) are other important factors.

If comprehension of syntactic structures is being investigated, the tasks devised to test them need to minimize cues to comprehension from the test situation so that the child's ability to respond correctly is a result of comprehension of the particular device being tested and not merely an informed guess based on one or more words in the sentence (cf, Bellugi-Klima, 1968). Thus, for example, Carrow (1968) ostensibly tested comprehension of Direct Object as against Indirect Object by asking 3-year-old children to "Show me the ball." The children's responses were apparently not compared with responses to the single word ball, however. Similarly, studies of such devices as conjunctions and certain comparatives frequently are studies of the comprehension of individual words rather than of syntactic structures. Of course, it must also be remembered that the testing should be simple and unambiguous and not unsettle the child with unfamiliar lexical items or excessively long sentences.

There are further and more fundamental problems associated with the study of children's comprehension, however. For example, if 60% of children of a given age level can correctly respond on a given comprehension task, to what extent can it be concluded that children of that age "comprehend" the particular linguistic device being tested? There is not an easy answer to this question, but it is clear that more attention needs to be given to the generality of findings on the comprehension of grammar. Thus a child of 6 years who "understands" a time connective in an 8-word sentence with familiar vocabulary may misinterpret such a device in a 15-word sentence. In long sentences he may find one part of a sentence particularly difficult and lose track of subsequent parts of the utterance which he would normally understand.

Part of the problem is that comprehension has for too long been considered an all-or-nothing process. Variables such as processing time as an indication of comprehension difficulty have been usually ignored by researchers. It is often overlooked that comprehension of spoken language must always be on the speaker's terms, for, unless he is interrupted, it is the speaker who controls the rate of speaking, the length of sentences, the syntactic complexity and the clarity of production.

Particular linguistic devices have rarely been tested in different syntactic environments, in both long and short utterances, in both speech and writing, and with different semantic complexity. Such factors, however, may lie at the heart of many comprehension difficulties. Until such investigations are undertaken, the relative difficulty of various linguistic devices under different circumstances will not be known, and many of the studies included in this review will remain of very limited value as indicators of the extent of children's comprehension.

Even assuming that the methodological problems are overcome, an even more fundamental problem remains concerning the nature of comprehension. For example, Inhelder et al., (1966) report that many children who can "comprehend" sentences containing such words as more at

the age of 5 years in static situations, cannot show correct comprehension of the same sentences in conservation tasks in which there has been spatial transformation of the objects or substances being compared. Similarly, Luria (1959) has reported that children "comprehending" the Russian equivalents of the individual words red, blue, don't, press, and so on, on being told to refrain from pressing a ball when a blue light appears, will in fact tend to press harder on the ball when the blue light is shown. He found that this effect existed until at least the age of 4. This whole question of the relation between language and thought must ultimately be part of a satisfactory theory of the development of communication skills, but will not be further considered here.

The kinds of problems outlined above have not deterred investigators from studying children's comprehension, and a number of testing techniques have been developed. The major kinds of techniques used are described hereinafter.

Tasks Involving Non-Verbal Responses

Acting-out a sentence. The subject is required to follow an instruction or act-out a sentence he hears (e.g., Show me; Make it so that). It has been claimed by Bever et al., (1968) that this technique results in the child paying closer attention to a sentence than if he merely has to respond to a representation of a sentence presented in two dimensions. This technique does have the advantage of being about the only one suitable for testing children under 4 years of age. Instrumentation, particularly for latencies, is difficult, however. The technique has been used by Shipley et al., (1969), Huttenlocher and Strauss, (1968) and others.

Game playing. By encouraging competitiveness between two subjects or between a subject and the experimenter, a subject can be highly motivated to perform near his capacity. The technique has been used by Olds (1968).

Referent identification. The subject is required to select (by pointing, pushing a lever, etc.) one of two or more referents to match a sentence he hears. This technique, adopted by Fraser et al., (1963) and Hatch (1969) is particularly suitable when accurate instrumentation is required.

Tasks Involving Verbal Responses

Recall. Imitation or immediate recall tasks in which the subject is required to repeat a sentence presented by the experimenter have been used by Slobin and Welsh (1967) and by Menyuk (1969). Used especially with younger children, this technique permits an investigator to see whether the subject's response, even if not an exact imitation, is

meaning-preserving. The most important advantage is that it permits investigation of an unlimited range of sentences which do not always lend themselves to other techniques of investigation. Imitation is not an accurate index of comprehension, however. Studies by Fraser et al., (1963) and Lovell and Dixon (1967), for example, have shown clearly that young children are able to imitate correctly certain sentences before they can understand what the sentence means.

Yes/No response. Subjects are presented with a referent and are asked whether a presented sentence matches the referent. This technique has been used by Turner and Rommetveit (1967) and by Gaer (1969) but has the potential disadvantage, especially in the case of negative sentences, of introducing such confounding paralinguistic factors as plausibility.

Synonymity. Subjects are asked whether two sentences mean the same, and are required to give a yes/no response. A major disadvantage of this technique is that it places a heavy strain on memory, which may very well interfere with a subject's ability to judge whether two sentences are synonymous. The technique has been used in part of a study by Beilin and Spontak (1969).

Recall of information. The test sentence is presented by the experimenter and then the subject is asked questions about the information contained in the sentence. The questioning can be immediate (e.g., Hatch et al., 1969) or conceivably at any time following the initial presentation. Although this technique is a more refined version of the kinds of techniques used in studies of information gain, the strain on memory must make it impossible to attribute any comprehension problems to linguistic processes alone.

Areas of English Grammar Previously Investigated

The following survey includes only those studies which have experimentally investigated the development of comprehension in children and reports the findings not in terms of developmental stages (because not enough is known to do this coherently), but rather in terms of various grammatical processes. Studies concerned with general questions such as the comprehension or recognition of grammaticality and deviancy are considered before studies of specific syntactic and morphological processes.

McNeill (in press) reports a previously unpublished 1965 investigation in which he replicated Miller and Isard's (1963) study with children aged from 5 to 8 years. Using the child's ability to repeat sentences as an indication of comprehension difficulty, he found that 5-year-olds find fully grammatical sentences only slightly easier than anomalous sentences. According to McNeill, "It apparently makes little difference whether one says to a child, 'Wild Indians shoot running buffalos' or 'Wild

elevators shoot ticking restaurants.' Both sentences are equally remarkable...One wonders how children and adults understand each other; for that matter, one also wonders how children understand other children. However, both questions arise on the false assumption that children do understand adults and each other...They probably do not understand the speech of others well." Clearly, McNeill's anomalous sentences are deviant because of the relaxing of selectional rules (Chomsky, 1965, p. 149) and his findings suggest that 5-year-olds have inadequately-defined semantic features matrices. In the Miller and Isard study with adults, grammatical sentences were found to be much easier than anomalous sentences. As McNeill notes, it is probably significant that the children came to distinguish the grammatical and anomalous sentences between the ages of 6 and 8 years, the age at which children begin making paradigmatic rather than syntagmatic word association responses.

Using a similar technique of ability to imitate correctly, Menyuk (1969) conducted a series of experiments with children aged from 34 to 75 months. Her findings do not entirely substantiate McNeill's. She found that the ability to repeat sentences by children within this age group was dependent on the structure of the sentence and not on the length of the sentence, up to and including sentences of nine words. However, when sentences were scrambled into non-grammatical strings, the length of the utterance became highly significant in determining the child's ability to repeat. The results of these studies support the intuitive position that children employ grammatical rules in decoding strings of words even at a very early age.

In the observational studies of language development it has been noted that the child passes through a "telegraphic" period whereby he omits function words in his speech (Brown & Fraser, 1963). Shipley et al., (1969) have conducted an ingenious experiment to determine whether children aged from 18 to 33 months respond better to commands given by the mother in telegraphic or in fully grammatical sentences. The youngest children, who were still at the holophrastic stage, did respond better to telegraphic than to full sentences. The older children, however, who were themselves producing telegraphic sentences, responded better to adult sentences with the function words present than to telegraphese. Thus, well-formed adult commands which are not characteristic of what the child produces himself are more effective than utterances typical of the child's own production. When a nonsense word was included in the command, a relevant response was given significantly less often by all subjects, e.g., Gor ronta dog was harder than the single word Dog, or Show dog (telegraphese) or Show me the dog. Unfamiliar nonsense words clearly disoriented the subjects. The authors concluded that "linguistic competence will be underestimated... when inferred simply from spontaneous speech."

Specific Syntactic and Morphological Processes

Subject-verb-object. Fraser et al., (1963) found that with children aged from 37 to 43 months the subject-object distinction in active sentences was a relatively easy one to comprehend. The subjects were required to select a picture illustrating a sentence such as The train bumps the car and to contrast it with another picture illustrating The car bumps the train. Lovell and Dixon (1967) replicated this result with children as young as 2 years of age. When Brown's famous subject, Adam, at 2 years of age, began using telegraphic S-V-O constructions (e.g., Adam make tower), he was tested for comprehension of contrasting structures (e.g., Show me the boat pushes the duck/Show me the duck pushes the boat.) Slobin (1968, p. 25) reports that Adam's performance at this stage was "confident and correct indicating that S-V-O sentences were not only produced but comprehended."

Indirect object/direct object. This distinction was found to be the most difficult of the 10 grammatical distinctions tested by Fraser et al., (1963) with children from 37 to 43 months. When distinctions such as The girl shows the cat the dog/The girl shows the dog the cat were tested, only 5 out of a possible 24 correct responses were made. In the Lovell and Dixon replication (1967) with British children from 2 to 6 years of age the distinction was also found to be the hardest of the 10 made. Whereas 35% of the 3-year-olds could imitate correctly, only 10% could show correct comprehension. At 6 years, whereas 100% of the imitation responses were correct, only 25% of the children could show correct comprehension. This suggests that the construction is not well understood by grade 1. Unfortunately, comprehension of the alternative dative form was not tested. That is, while children clearly have difficulty with The girl shows the dog the cat, they may find The girl shows the cat to the dog much easier.

Verb complement relations. Carol Chomsky (1968) investigated the comprehension of the complementation of the three verbs ask, tell and promise, by 40 children between the ages of 5 and 10 years. Her study represents an attempt to investigate comprehension of more complex constructions than have typically been investigated. In particular, she investigated sentences which observe or violate the Minimum Distance Principle in English. Sentences in which the subject of a wh-clause is the immediately preceding noun phrase and the object of the main clause observe the Minimum Distance Principle. Sentences in which the subject of the wh-clause is also the subject of the main clause violate the principle. Thus, I told John what color to make the circle observes the principle, while I asked John what color to make the circle violates it. Chomsky investigated three different structures with ask and tell so contrasted.

1. Wh-clause, subject supplied:
   e.g., Ask/Tell Laura what color this is.

2. Noun phrase:
e.g., Ask/Tell Laura the color of this book.

3. Wh-clause, subject omitted:
e.g., Ask/Tell Laura what color to make the square.

The 5-year-olds tended to interpret ask and tell and were unable to apply the exception to the Minimum Distance Principle on any of the three structures. Thus they would have responded to Ask Laura what to paint by saying, What do you want to paint? By age 9, most of the children had acquired the distinction, but there were three distinct intervening stages betwee the ages of 5 and 9. With the distinction between X tells Y to lie down and X promises Y to lie down it was also not until age 9 that there was uniformly successful comprehension. Chomsky has argued that these verb complement constructions "are strongly subject to individual rates of development." In a replication of this study, Luria and Kramer (1969) found that it was not until around 12 years of age that some children handle exceptions to the Minimum Distance Principle competently. There are certainly clear indications that even in this relatively small area of syntax, learning goes on well beyond the beginning of school. Chomsky has also noted that her subjects found that sentences of the type, Ask/Tell him what the time is, are easier than those of the type, Ask/Tell him the time, even though the latter are shorter. This has been interpreted as suggesting that sentences in which the surface structure makes the deep structure explicit are easier to comprehend.

Olds (1968) investigated the same grammatical distinction as Chomsky, this time in a game situation with subjects aged from 7 to 11, and found that many 7-year-olds and some 9-year-olds were not able to interpret instructions with ask and tell (e.g., Ask/Tell X which piece to move one space). The percentage of errors on sentences with tell was 15% as against 39% with ask. The presence of a pronoun (Ask your opponent which piece you should move one space) helped the children to correctly interpret the instruction. It is worth noting that it does not seem that the cause of the greater difficulty of ask lay in the ambiguity of ask (as a request or question) as against the non-ambiguity of tell, for some children interpreted ask as tell and others tell as ask. There was no clear pattern. Rather, it suggests that some of the children, even as late as 11 years of age, did not semantically differentiate ask and tell as lexical items and that this, interacting with the grammatical rule embodied in the Minimum Distance Principle, lay at the root of the difficulty.

Worth noting also is that the facilitating effect of the presence of the pronoun, noted above, and Chomsky's observation that sentences whose structure makes the deep structure explicit are easier to comprehend, suggest that more attention should be given to the explicitness of syntactic structures in materials for children. As an example, in the instructions for the California Achievement Tests for children of

grades 1 and 2, the children are told, "Do not turn this page until told to do so." It might reasonably be predicted that children would find such an instruction easier if the time clause were until you are told to do so, or, using the active voice until I tell you to do it.

Relativization. Because of its importance as the process by which noun phrases are modified by embedded sentences or by branching, and in some transformational grammars, as the source of adjectives, it might be expected that the process of relativization would have been extensively studied in developmental psycholinguistics. This is not the case, however. Three recent studies constitute the literature, and none of these are highly revealing.

In a study with 60 upper middle class boys aged 7, 9, and 11, Olds (1968) found that the single-level embeddings he tested "posed very little comprehension difficulty" with an error percentage of only 7.5%. Only one error was made by a subject over 9 years of age. Using a game situation, the major variable tested was whether deletion of the relative pronoun affected comprehension. Thus, for example, the piece that your opponent moved may be moved two spaces was compared with the piece your opponent moved may be moved two spaces. While the response accuracy of the two types did not differ significantly, latency scores showed that subjects took about half a second less time to respond to the longer sentences containing the relative pronoun than to those with relative deletion. Again, it seems reasonable to conclude that comprehension is facilitated to the extent that the surface structure makes the deep structure explicit.

At a much earlier age with an echolalic child aged 2 years and 6 months, Slobin and Welsh (1967) found that their subject had special difficulty imitating sentences containing an embedding. In fact she repeated sentences containing relativization as conjoined sentences (as long as the relative was not deleted). For example she changed the sentence structure but preserved the meaning of the following sentences: Mozart who cried came to my party → Mozart cried and he came to my party. However, when there was wh-deletion, a failure of comprehension was indicated:

The house the boy hit was big → Boyhouse was big.
The boy the book hit was crying → Boy the book was crying.

Although Slobin and Welsh suggest that the child searched for a S-V-O relationship in attempting to decode the sentence, it seems much more likely that the child searched for a topic-comment relation (cf, Gruber 1967).

Gaer's (1969) study with 3- to 6-year-old children and with adults presents a number of problems. Three types of embeddings were compared with non-embedded sentences. Those considered were:

1) Simple sentence (e.g., The boy is throwing the ball down the hill)

2) Single embedding (e.g., The girl sees the boy who is kicking the ball)

3) Center embedding (e.g., The cat the girl sees is playing with the ball)

4) Double embedding (e.g., The man is watching the boy catching the ball the girl is throwing)

In the comprehension phase of the experiment, subjects were shown a picture and had to respond "Yes" if the picture showed the sentence heard and "No" if it did not. Although types 3 and 4 were found to be significantly harder than type 1 for children ($p < .01$) it is the accuracy of the responses for the various types which is notable. At 3 years, the percentage of correct responses on type 1 was 65%, while the other three types hovered around 50%, which is chance. By 5 years only 69% of the responses on type 1 were correct, 67% on type 2, 59% on type 3 and 63% on type 4. By age 6, the differences between the sentences were small with between 70% and 78% accuracy on all types. What is notable is that on the sentences tested, 27% of the sentences were incorrectly understood at the age of 6 years. Unfortunately, the design of the experiment makes it impossible to attribute this entirely to syntactic variables. Also being tested was the interaction with negation, passive voice and questions, and no account was taken of the plausability of the utterance, especially in the light of the type of affirmation/denial response required (cf, Wason, 1965). Moreover, as the author notes, for a sentence like The boy sees the girl eating a cookie her mother baked the visual contrast was simply between a boy watching and not watching! There also appears to have been no control over the presence or deletion of the relative. Finally, the length of the sentences tested could well adversely affect the performance of 3- and 4-year-olds. Apart from these methodological drawbacks, however, the study does indicate that relativization is difficult, especially for children up to grade 1 level at least, and that it is likely many such sentences will not be comprehended correctly.

Connectives. Comprehension of the process whereby a contingency is appended to a statement by means of a connective has been investigated by several researchers, but only a limited number of connectives have been included in the investigations. Predominant among them have been those initiating temporal and conditional contingencies.

Comprehension of temporal contingencies beginning with before, after, when, and as soon as, has been investigated by Olds (1968) with boys 7, 9 and 11 years. At these ages the children showed a uniform ability to interpret the sentences correctly. Contingencies with before proved more difficult than the others, but this could be anticipated in this particular investigation because it was the only type in which the chronological sequence was reversed from the order of the clauses.

Hatch (1969) in a closer investigation of time connectives with children aged 5 and 7 years and using both accuracy and latency measures found the same general effect. "Both age groups responded better on the tasks when the order of mention in the sentence was the same as the order of the action required." The order of difficulty from easiest to hardest was:

1. Sentence 1 and then Sentence 2
2. Sentence 2 but first Sentence 1
3. Sentence 1 before Sentence 2
4. After Sentence 1, Sentence 2
5. Before Sentence 2, Sentence 1
6. Sentence 2 after Sentence 1

Accuracy was generally high (around 90%) even for the 5-year-olds except on tasks 5 and 6 where accuracy hovered a little above 50%. Tasks 5 and 6 were significantly more difficult ($p < .01$) than types 1, 2, and 3.

Certain conditional contingencies were also investigated by Olds and Hatch. Olds (1968) investigated comprehension of the following nine sentence types with boys between 7 and 11 years of age.

1. Conditional with "if" initial and one referent.
   If you have a circle, you may move it one space.

2. Conditional with "if" initial and two referents.
   If you have a circle, you may move a triangle one space.

3. Conditional with "if" final and two referents.
   You may move a square one space if you have a triangle.

4. Conditional with "should" and one referent.
   Should you have a circle, you may move it one space.

5. Question and one referent.
   Do you have a large piece? Then you may move it one space.

6. Conditional with "if" + "not" initial, and two referents.
   If you do not have a large piece, you may move a circle.

7. Conditional with "if not" final, and two referents.
   You may move a circle, if you do not have a large piece.

8. Conditional with "unless" initial, and two referents.
   Unless you have a large piece, you may move a circle.

9. Conditional with "unless" final, and two referents.
   You may move a circle, unless you have a large piece.

The order of difficulty as measured by accuracy correlated .83 with the order as measured by latency--harder sentences took longer. The results showed that for sentence types 1-5, the subjects had an evenly spread overall error rate of 2.3% (with a total of 600 responses), and the results clearly indicate that boys aged 7 to 11 years have mastered these types of conditionals. With types 6 and 7 there was a 15% error rate and little improvement with age. The added difficulty could be attributed to the negative. Although types 8 and 9 are semantically equivalent to types 6 and 7, they proved far more difficult (53% error rate). Most of the errors came from the 7- and 9-year-olds. In fact, 15 out of a total of 40 boys aged 7 and 9 years never interpreted these sentences correctly, and another 16 of the 40 made only one correct response in four attempts. It seems clear that the younger Ss were interpreting "unless" as "if" instead of "if not." When it is recalled that Olds' subjects were from upper middle class families and of above average intelligence, it is noteworthy that complete control of these syntactic structures was still not achieved by 9 years of age.

Hatch (1969) with 5- and 7-year-olds found that the position of the dependent clause (initial or final) was not a significant variable with conditionals. She examined the effect of the affirmation (+)/ negation (-) variable and clause order with the following eight combinations.

1.	If-clause +	Main clause +
2.	Main clause +	If-clause +
3.	If-clause -	Main clause +
4.	Main clause +	If-clause -
5.	Unless-clause	Main clause +
6.	Main clause +	Unless-clause
7.	Unless-clause	Main clause -
8.	Main clause -	Unless-clause

The following combinations were not tested:

Main clause -	If-clause -
If-clause -	Main clause -

The results showed that the 5-year-olds comprehended at around the chance level except on type 2. The 7-year-olds achieved a high level of comprehension on sentence types 1, 2, and 8 (around 90% correct)

and comprehended about 65% of types 3, 4, and 7. However, they correctly comprehended well below 10% of the examples of types 5 and 6. On types 5 and 6, but not on types 7 and 8, this study confirms Olds' observation that to the age of 9 years children consistently interpret unless as if than as if not. Hatch's study brings to light the intriguing finding that if the main clause was negative her 7-year-olds could correctly comprehend the contingency introduced by the clause beginning with unless--76% of the responses were correct for type 7 and only 7% for type 5. On the whole, latencies were longer on those types which the error-scores had shown to be most difficult. Again, however, types 5 and 6 were exceptions. Subjects responded quickly and with great certainty, but incorrectly.

This study makes it clear that even the relatively simple conditionals tested were beyond the comprehension of 5-year-olds, and even at 7 years, uniformly high comprehension was not achieved. It is worth noting that the children had no problems with the task so long as the sentence was not in a conditional form. The inherent difficulty of conditionals is further apparent in the results of an accompanying repetition task in which it was found that 5-year-olds showed a strong tendency to mis-repeat, for example, If it's black, comb your hair, was changed to Is it black, comb your hair. Similarly, Unless it's green, touch your shoes, tended to be changed to An' it's green, touch your shoes. This suggests that the child may use a different or modified set of rules for generating the structures carrying conditional concepts. One aspect of the task situation, however, may have confused or distracted the younger children. They were required to select one of two pictures which illustrated the sentence they heard. While hearing, for example, Unless it's green touch your shoes, they had to respond to a picture of another child doing this. The subject may have tried to put himself in place of the child in the picture and compounded his comprehension difficulties.

The investigation of the comprehension of conditionals has touched on only a few of the variables. The verb-form sequences which are a major factor in the semantic interpretation of conditionals, and of which there are at least 324 possible combinations in English (Hill, 1960) have not been investigated at all. Also the effect of negation in what was formerly called the subjunctive requires investigation, partly because it is an area in which a correct semantic interpretation requires the negative to be understood in what amounts to an affirmative sense. For example, in If you hadn't noticed the leak, the house would now be flooded, the negative in the if-clause has to be interpreted as an affirmation (you noticed it) while the main clause has to be interpreted as a negative (The house isn't flooded). These problems are compounded by the use of verb-forms in unfamiliar time relations. In If you were preparing the budget what would you do? the form were preparing, normally associated with past time, here refers to present or future time.

Most of the other studies of various connectives shed much less light than those reviewed so far. Olds (1968), for example, found simply that comprehension of the limiting contingency connectives although and but was well within the capabilities of the 7-, 9-, and 11-year-old boys he tested.

Robertson (1968) studied the reading comprehension of certain connectives with children from 8 to 12 years. The "connectives" (some of which were in fact relatives) were studied as lexicon rather than as syntax. Subjects were required to select one of four alternatives to complete a sentence after a given connective. This is a poorly conceptualized and executed study in which there is no evidence that there were controls for syntax, sentence length or semantics, but for the record, it was found that subjects had more difficulty with however, thus, although, yet, than they did completing sentences after because, if, so, and, but, for, which, that, when, where and who.

Katz and Brent (1968) with grade 1, grade 6, and college students attempted to investigate the comprehension of connectives by asking subjects to justify their selections of what seemed the more appropriate of two sentences presented to them. One of the sentences included a connective, the other did not. Not unexpectedly, the young children found it extremely difficult to explain their choice of sentences even though their choices were in general correct. The "connectives" included in the study were because, then, therefore, and then, when, and, but, although.

Hatch et al., (1969) found that 5-year-olds performed significantly worse ($p < .01$) on conjoined sentences with a reversed subject-verb order. For example, and so did Mary was harder than and Mary did too. Similarly, and neither did Bill was harder than and Bill didn't either. In addition, conjoined sentences in which redundancy was reduced by deletion of an identical verb proved more difficult ($p < .01$) than those without deletion. John found a nickel and Bill a dime was harder than John found a nickel and Bill found a dime. The subjects were read a sentence and then asked a question about the content of the sentence (e.g., What did X do?). There are problems associated with the study, including that the study was really intended to test the now discredited Derivational Theory of Complexity, and was not primarily an investigation of conjunction, and also that some of the sentences had grammatical but not really "logical" conjunction (e.g., Father put on a shoe and the teacher put on a hat). However, this study is suggestive of further investigation in an area more complex than is usually attempted in studies of comprehension.

Active voice/passive voice. In a study with children aged from 37 to 43 months, Fraser et al., (1963) were almost certainly the first to experimentally investigate children's comprehension of the active/passive contrast in English. They found not only that the subject/object contrast was easier in the active voice than in the passive, but also that the responses of many of the children indicated that

they systematically interpreted passives as actives. That is, the children appeared to follow the usual rule of English word order in which the subject precedes the object, and thus, instead of interpreting The girl is pushed by the boy as object (verb in tne passive) subject, they processed it as subject (verb in the active--with odd appendages like is, -ed, by) object. Whether children 3 years of age have more difficulty with passives because passives have inherently more difficult rules, or because they hear fewer passive sentences, or because actives are often slightly shorter was not revealed by this study.

In the Lovell and Dixon (1967) replication of the study by Fraser et al., it was shown that the passive continues to be very difficult for children up to 6 years and 5 months of age. On the task, which involved selecting one of two pictures to match the sentence heard, the 2-year-olds scored none correct out of a possible 40 correct responses, the 3-year-olds 5 correct, the 4-year-olds 6 correct, and the 5- and 6-year-olds 12 correct. Thus, even by grade 1 only 30% of passives were correctly comprehended.

A new aspect of the comprehension of active and passive sentences was uncovered by Slobin (1966a). With children aged from 6 to 12 years and with adults, he found that the semantic constraint of reversibility as against non-reversibility affected comprehension of actives and passives. A reversible sentence is one in which the actor and the acted-upon can be interchanged and still leave a semantically acceptable sentence, such as, The politician criticized the general. A non-reversible sentence cannot have actor and acted-upon interchanged, as in The politician criticized the war. Slobin's measure was latency of response. His subjects had to indicate by pressing "Right" or "Wrong" switches whether a presented picture matched a sentence read by the experimenter. Although the kindergarten children made over 18% erroneous responses over a number of tests, Slobin does not give details of response accuracy except to point out that the average number of errors decreased with age and "was never very high." At all ages the response time for non-reversible sentences was faster than for reversible sentences, and this effect was particularly noticeable with passives. In fact, for non-reversible sentences the passive responses were no harder than the active equivalents.

Comprehension of sentence voice and reversibility has also been investigated by Turner and Rommetveit (1967) with children aged from 4 years and 3 months to 9 years of age from middle class homes. Two sentences were read aloud to the subject and he was to respond (Yes/No) after each as to whether it described a picture placed before him. Of the kindergarten children, 77% could show comprehension of non-reversible passives but only 48% could correctly respond to reversible ones. Moreover, it was not until the grade 3 level that "a ceiling of perfect scores was approached." Contrary to Slobin's finding, sentence voice was found to be a stronger factor than reversibility. The order of difficulty of the sentence types over all Ss was: Non-Rev. Active < Rev. Active < Non-Rev. Passive < Rev. Passive. All effects were significant beyond the .001 level. In both reversible and non-reversible

sentences a major source of error was the inversion of actor and acted-upon. It seems clear that children even as late as 9 years of age have difficulty in processing sentences in which the actor/acted-upon elements do not coincide with grammatical subject-object. This apparent dominance of topic-comment relationships over the subject-object relationships with young children has been noted previously in this review and would merit closer investigation.

An interesting effect of reversibility is reported by Sinclair-de-Zwart (1969) in research on voice with French children. She reports that several subjects at about the age of 4 years and 6 months decode a passive sentence as a reciprocal act. Peter is washed by Mary is acted out by the subjects in such a way that Peter and Mary each take a sponge and wash each other. "The red marble is pushed by the blue marble is acted out (by the child) by taking a marble in each hand and making them hit each other, whereas the corresponding active sentence is acted out (by the child) by taking the blue marble in one hand, leaving the red marble on the table, and hitting the latter with the blue one."

Bever et al., (1968) found that while 2-year-olds make more errors on active than on passive sentences, the semantic constraint of non-reversibility does not facilitate comprehension. By the age of 3, however, non-reversible sentences begin to be easier than reversible ones. The subjects in the experiment were required to act out three kinds of active sentences and their corresponding passives:

1. Reversible (The truck pushes the car)

2. Semantically constrained (The mother pats the dog)

3. Irreversible (The policeman eats the candy)

The 83 2-year-olds showed almost perfect comprehension of simple active reversible sentences despite the absence of semantic cues to comprehension. Even with the "improbable" reversals of the semantically-constrained sentences (e.g., The dog pats the mother), only 80% of the 2-year-olds correctly interpreted the first NP as actor and the second NP as acted-upon, in spite of the implausibility of a reversed interpretation. With passives, however, it would seem that such a processing technique would clearly result in all passives being interpreted systematically, but incorrectly. This was not so. It was found that the 2-year-old responds correctly to all physically possible actives, and responds randomly to all physically possible passives, whether plausible or not. By age 3, however, the semantically-constrained sentences became significantly more difficult on both active and passive, before again showing a gradual improvement with age. This temporary drop in performance was attributed to an over-generalization (based on experience) of the use of semantic cues in sentence interpretation.

Bever et al., suggest that initially (around 2 years of age) the grammatical relationship of S-V-O dominates the semantic relationship of topic-comment or theme (Halliday, 1966), and that later such semantic factors as reversibility and non-reversibility are used to assist syntactic processing (cf, McNeill-in press). Other such semantic factors might include plausibility (cf, Wason, 1965) and the relationship between referential situation and a sentence (cf, Huttenlocher et al., 1968; Huttenlocher & Strauss, 1968).

Huttenlocher et al., (1968) showed that in a task requiring fourth-graders from middle class homes to place one object (mobile) relative to a second object (fixed), for active sentences it was easier to place the object which was the grammatical subject rather than the grammatical object (e.g., The red truck is pushing the green truck). For passives, however, it was easier to place the truck, which was the grammatical object (yet logical subject or actor). Actives in general were easier than passives. Response latency was the measure.

Studies not examining the reversibility factor, but generally substantiating the above findings on the difficulty of the passive include those by Beilin and Spontak (1969) and Gaer (1969). Beilin and Spontak used a picture-identification task (selecting one of two pictures to match a sentence) with children aged 4 years and 9 months to 7 years and 11 months from middle class homes. The nursery school children averaged over 80% correct comprehension of active sentences and the first-grade children achieved 93% correct responses. Much lower comprehension was indicated on passives, however, especially on sentences with indirect objects. On passives with only a direct object 52% of the nursery school responses were correct, 73% of the first-grade responses correct, and 95% of the second-grade responses correct. On passive sentences which included an indirect object, 23% of the nursery school responses were correct, 23% of the first-grade responses were correct and 83% of the second-grade responses were correct. Part of the explanation for these results lies no doubt in the extra length of sentences with indirect objects. However, explanations of the causes of poor comprehension still do not conceal the fact that poor comprehension exists.

Gaer (1969) in a study with children aged from 3 to 6 years, found that passivization interacted with the syntactic complexity of the sentence. Thus the greater the number of embeddings, the more the difficulty of the passive.

Interrogatives. Considering the significance usually attributed in language studies to questions, surprisingly little is known about when children learn to understand interrogatives. Gaer (1969) in a rather untidy study, found that with 3-year-olds Yes/No questions were understood as well as active affirmative sentences (e.g., The boy is throwing the ball down the hill/Is the boy throwing the ball down the hill?). About 60% of the responses were correct for 3-year-olds, 75% for 5-year-olds, and 85% for 6-year-olds.

Incidental to a study of conjunction, Hatch et al., (1969) found that 5-year-olds reacted differently to wh-questions and other requests for information. Theirs were more accurate responses and faster latencies in recall to questions of the type What did X do? than to requests Tell me about X and Y. Whether the difficulty of the second sentence came from the greater load on short term memory or because of syntax is not known.

Negation. Studies by Wason (1961, 1965) and others have shown that negation is semantically more difficult for adults than affirmation. Gaer (1969) found that this was also the case with children as young as 3 years of age. Further, not only does it take longer to evaluate the truth or falsity of negative than affirmative statements with amount of information equated, but a plausible denial is easier than an implausible one (Wason, 1965). Zern (1967) replicated Wason's findings with children in grades 3 through 6. Slobin (1966a) found that children aged from 6 to 12 years had more difficulty judging if a sentence was false than if it was true when the sentence was affirmative, but more difficulty judging if a negative sentence was true. Truth value, grammatical affirmation, and negation thus interact.

Other studies with children have shown that negation is more difficult than affirmation, but little is known about the age of acquisition or the extent of the difficulty. Fraser et al., (1963) reported that with simple contrasts of the kind The boy is sitting/The boy is not sitting, 3-year-olds could show correct comprehension of the contrast on about 70% of responses--considerably higher than any of the other nine grammatical contrasts studied. The Lovell and Dixon (1967) replication of this study with British children showed almost 100% correct responses from even the youngest group (mean age 2 years and 6 months).

Clearly, however, there is room for systematic study of the development of comprehension of negatives, not only with age as a variable, but also with different kinds of verbs, sentence structures and sentence lengths. The studies by Fraser et al., (19[illegible]) and Lovell and Dixon (1967) were with the simple copulative verb be, w[illegible]e the negative not follows the verb is. It would seem important to k[illegible]w when comprehension develops with other verbs which have different surfa[illegible]e structure negation forms preceding the verb as in doesn't open.

Using longer sentences Hatch et al., (1969) in their study of conjunctions found that negation did not prove significantly harder for 5-year-olds than did affirmation. Sentences such as, John ate a sandwich and Mary ate a hotdog and John didn't eat a sandwich and Mary didn't eat a hotdog were tested employing both accuracy and latency measures. This surprising result suggests that further investigation is needed.

Prepositions. All the studies reported in the literature have been restricted to the incredibly limited area of prepositions used to initiate locative adverbials. This is an extremely small part of the

range of prepositional syntax and semantics, and hardly touches the rich range of meanings and uses of even those prepositions that have been investigated (cf, Pittman, 1966).

Slobin (1968) reports a study by Sokhin with Russian children aged from 23 to 41 months on the comprehension of the Russian equivalents of on and under. Until 28 months, the children often could not follow an instruction to place one thing on or under another. Up to 36 months, Ss often confused on and under.

With English-speaking children aged from 3 to 5 years, Turton (1966) found that by 3 years and 6 months, children could generally comprehend in, on, out of, off, and under; by 4 years and 6 months they could also comprehend over, between, and behind; by 5, in front of was understood. However, the limited scope of such a study should be recognized. The Oxford English Dictionary lists over 40 meanings of on, for example, and many of these uses are frequent and yet would not be tested by an instrument which requires a child to show that he comprehends on by merely requiring him to place a toy on the table. Omitted from such a test are uses such as:

We'll do it on Wednesday.	He's on a visit.
You did it on purpose.	He's on a committee.
It's on the ceiling.	She's on the phone.
It's on the first floor.	

Such examples of uses of on can no longer be dismissed as "idioms" for they have wide applicability over a large range of lexical items (Pittman, 1966). There is enormous potential for investigation of the comprehension of prepositions.

In addition to those prepositions investigated by Turton, Kaplan and Yonas (1967) noted that nursery school children could comprehend the function words down, up, and around.

A study by Huttenlocher and Strauss (1968) with children aged 5, 7, and 9 years (replicated by Bem [in press] with 4-year-olds) shows that comprehension of the prepositions on and under in a sentence is a function of both lexical and referential factors. It was found that when subjects had to place a mobile item on or under a fixed item, it was easier to place the mobile item if it was the grammatical subject of the sentence. For example, if a red block was fixed and the child was given a green block to place, Make it so that the green block is on/under the red block was found to be easier than Make it so that the red block is on/under the green block. The results held for both accuracy and latency measures. It was suggested that comprehension is facilitated by a correspondence between the forms of a linguistic description and the referential situation, and that the problem for the child was to bring the experimenter's statement into correspondence with events which required a particular form of description. The extent to which this may be true in other areas of English remains unknown.

Pronominals. Comprehending the referent of pronouns sometimes depends on cues from outside the syntax, semantic constraints, common sense, or a combination of these. In Peter told Robert he felt sick, he presumably refers to Peter, while in Peter told Robert he looked sick, he refers to Robert. Carol Chomsky (1968) investigated children's ability to disambiguate the pronoun referents of sentences such as, When he was seven, Mickey learned to throw a ball. The children were asked, "When who was seven?" It was found that children over 5 years and 6 months could comprehend such constructions, while those below that age confused the pronoun referents. Chai (1967), however, in a study using pronouns with ambiguous antecedents, found that while eighth-grade children could generally resolve ambiguities by choosing the most appropriate referent in each sentence, fifth-graders in general were not able to do this. Chai's task was more difficult than Chomsky's but the results again point up an area where it is not entirely meaningful to make the blanket statement that children "know" their language by the time they go to school.

Determiners. Brown (1957) found that on about 75% of the responses, children 3 years of age can recognize the role of certain determiners in marking mass and count nouns. When presented with nonsense pictures, children could correctly distinguish a sib from some sib. Further, these could be contrasted with a verb form, sibbing. However, in a later study, Fraser et al., (1963) found that children from 36 to 38 months managed to make the mass/count distinction correctly on only about 50% of the responses in a comprehension task. Lovell and Dixon (1967) found a similar chance level of achievement at that age, and even at the age of 6 years and 6 months, only 83% of correct responses used both real and nonsense stimuli.

Tense. Very little is known about children's comprehension in this area of English grammar. Fraser et al., (1963) found that 3-year-olds could correctly distinguish the present progressive from the future verb forms about 67% of the time, and the present progressive from the past about 54% of the time. Lovell and Dixon (1967), on the same test, found that children correctly comprehended the present/future distinction on 50% of the responses by the age of 2 years and 6 months, 83% by 3 years and 6 months, 90% by 4 years and 6 months, and 100% by 5 years and 6 months. On the present/past distinction, 35% of the responses of the children by the age of 2 years and 6 months, showed correct comprehension, 50% by 3 years and 6 months, 65% by 4 years and 6 months, and 95% by 5 years and 6 months. The performance of those 2 years and 6 months old suggests that many of the children systematically misinterpreted the past tense for the present tense.

A poorly-designed study by Herriot (1969) in which a present perfect verb form was tested as a "past tense" (Which one has glinged?), and in which the child's attention to present events clearly proved to be a distraction when the "past" and future forms were being contrasted with the present progressive, concluded that 3-year-olds "understand" past,

present, and future tenses when a nonsense word or unfamiliar referent is used. However, "understand" is not a very precise index. Much more must be known about children's comprehension of tense in other contexts.

Number. Fraser et al., (1963) investigated only three number contrasts. It was found that the contrast between third person singular and plural as in The boy draws/The boys draw was very difficult for 3-year-olds, with only 29% of their responses being correct. These results suggest systematic misinterpretation, and unfortunately the direction of the bias is not revealed. For number marked by is/are (The sheep is running/The sheep are running), 50% of the responses were correct. For the contrast between singular and plural possessive pronouns (his, her, their), 63% were correct.

Lovell and Dixon (1967) found that on the third person number distinction, only 10% of the children's responses were correct by the age of 2 years and 6 months, 30% by 3 years and 6 months, 65% by 4 years and 6 months, and less than 75% by the age of 6 years and 6 months. On the is/are distinction, the responses were 12% correct by the age of 2 years and 6 months, 58% by 3 years and 6 months, 63% by 4 years and 6 months, and 93% by 6 years and 6 months. On the possessive pronoun distinction, over 25% of the children's responses were correct by the age of 2 years and 6 months, 65% by 3 years and 6 months, 70% by 4 years and 6 months, and 90% by 6 years and 6 months.

Anisfeld and Tucker (1967) found that 6-year-olds seemed to prefer to use numerals rather than grammatical inflections to indicate plurality, and that they made more errors with /s/ and /iz/ plural allomorphs than with the more frequent /z/ allomorph. The finding that comprehension of even this limited area of pluralization is not completely mastered by children beginning school is supported by Beilin and Kagan (in press) who found that for 3- to 5-year-olds the comprehension of pluralization by inflectional means was inferior to pluralization by simple numerals. It was also found that noun inflections (car/cars) were easier than verb inflections (The fish is/are swimming).

Comparatives. Comprehension of certain comparatives has been the subject of several investigations with both English and French children as part of the extensive research on cognitive development conducted through Piagetian conservation studies. The major debate in the literature has been over the age at which children are able to recognize equivalence of quantity across spatial transformation, and whether or not a child's failure to "conserve" is the result of his not comprehending language, or the result of cognitive immaturity. Much of our knowledge of children's comprehension of comparatives is thus based on incidental findings by developmental psychologists rather than on systematic studies by psycholinguists. One very important aspect of the investigation of comparatives is that it has not been conducted in a semantic void as has been the case with the other areas of syntax. Investigations of the comprehension of comparatives have been carried out with a semantic unity which results from being concerned only with quantitative comparisons. However, the investigations have been neither systematic, exhaustive nor even in agreement.

Inhelder et al., (1966) characterize the Piagetian position when they report that children aged 4 to 6 years "correctly execute orders" involving the comparatives more and less, even if they fail conservation tasks. That is, they can understand that six marbles are more than three marbles even if they report that a long row of six marbles has more than a short row of six marbles. In general, children understand more and less with count nouns (discrete objects) earlier than they do with mass nouns (continuous substances).

Sinclair-de-Zwart (1969) substantiates these findings and further notes that after the age of 4, a wide range of comparatives (e.g., bigger, taller) are comprehended. Both Inhelder and Sinclair-de-Zwart have conducted their investigations with French children, but their findings have support in a growing literature of studies with English-speaking children.

Mehler and Bever (1967) report that children between 2 years and 6 months and 3 years and 2 months correctly use the word more to discriminate the relative number of objects in two rows. That is, the children can report that a short row of six balls has more balls than a superficially longer row of four balls. Between 3 years and 2 months and 4 years and 6 months, however, they indicate that a longer row with fewer objects has more. The authors attribute this loss of ability to discriminate comparative quantities to the temporary interference of an overgeneralized perceptual strategy (cf, Bever, Mehler, & Valian, 1968). That is, they suggest that the child opts for a strategy that runs, "Anything that looks larger is made up of more members." The child learns to modify this strategy.

Piaget (1968) and Beilin (1968) have each disputed, on methodological grounds, the claims of Mehler and Bever that their findings have reference to the acquisition of the ability to conserve. However, the results on the comprehension of the word more are not disputed. Beilin, in fact, found that from the age of 3 years, children could often comprehend the word more in the additive sense of more of than before as well as the comparative sense of more than.

There have been a number of studies concerned specifically with the extent to which children comprehend the linguistic devices used in the conservation studies. The findings of some of these studies are conflicting, and all have been conducted with children under 6 years of age. Moreover, all have been concerned with the comprehension of one or more of the words more, less, and same rather than the syntactic environment in which they occur.

Beilin (1965) for example, tested kindergarten children in a pretest to a conservation training task, and found that when the children were asked whether the subject or the experimenter had more items, 94% responded correctly. When asked who had less items, 85% responded correctly, and only 48% correctly judged equality. However, the incredible complexity

of the question asked the children makes it unlikely that these results can be taken seriously. The children were presented with two rows of corks and were told the following: "In this game you have to figure out if these two rows are the same or different. If these were candies, and this side was mine, and this side was yours, would you have more, less, or the same as I?" Not only were these kindergarten children required to decode a difficult conditional sentence (which other studies have shown to be difficult), but also the sentence was really a multiple question and one of such length that it inevitably placed a strain on the children's short term memory capacity.

Griffiths, Shantz, and Sigel (1967) found that the comprehension of preschool children (aged 4 years and 6 months) of comparisons using more, less, and same interacted with whether the number, length, or weight of objects was being compared. An ordered series of test questions was asked:

1. What can you tell me about these two sets of (lollipops)?

2. Are these two sets of (lollipops) the same or are they different?

3. Does this set of (lollipops) have more lollipops, less lollipops, or the same number of lollipops as this set?

4. Point to the set with more (lollipops) and then to the one with less lollipops.

If the child responded with an appropriate comparative (more, same, or less) to question 1, he was considered to use the term "spontaneously." If he did not respond to question 1, essentially a production task, he was asked the other three questions until a response occurred--essentially a comprehension task. In writing up the experiment, the authors do not distinguish between comprehension and production, but report that their subjects "had most difficulty using the term same correctly." The subjects had least difficulty using all three terms in length comparisons. More was easier with length and weight comparisons than with number ($p < .01$). Same was used correctly consistently across all three semantic areas by only 40% of the children, whereas the percentages for more and less were 70% and 65% respectively. It is not clear whether the difficulty with same is a result of the question types used or whether it is inherent. If inherent, it is still not clear whether comparisons with same are difficult because children perceive differences more easily than similarities, whether they have experienced more and less more frequently, or because of the ambiguity of same, which can mean identical (look alike) or equivalent (cf, Braine & Shanks, 1965). The importance of considering syntactic controls before drawing conclusions (not done in this study) is made even more apparent when the response types are considered. The -er comparative form (longer) was an appropriate response for length comparisons, whereas for number comparisons, constructions with more and less were required.

Whereas the study by Griffiths et al., (1967) with its methodological weakness, showed that comparisons of equality with same were harder than comparisons with more and less for 4-year-olds, Dodwell (1960), with children up to the age of 6 years, found that more children could successfully complete a conservation task when asked if there were the same number of items in two arrays than when they asked which array had more.

These apparently conflicting results are further complicated by the findings of other studies. Siegel and Goldstein (1969), with children from middle class homes aged from 2 years and 6 months to 6 years, found that up to the age of 4 years and 7 months, the majority of the children in their sample did not show comprehension of comparisons with more, less, or same and that children tended to choose the last-mentioned word as basis for responding. By age 5, 75% of the children could show comprehension of the test sentences. However, an examination of the test sentences reveals that their syntactic variety and length, and the multiple parts precludes the drawing of firm conclusions about the comprehension of comparatives. The test sentence, Which row of pennies has more (less), this one or this one? systematically draws the child's attention from one item to the other, and children can be expected to point to the last mentioned if the rest of the sentence has imposed a burden on memory. The difficulty of questions with multiple parts, as in, Are there the same number of pennies in each row, or does one row have less or more pennies than the other row? has been noted by Rothenberg (1969).

The Rothenberg study, however, points up yet another methodological problem which is of particular relevance with studies of socioeconomic differences in language comprehension. As part of her study, Rothenberg tested comprehension of sentences containing more and same by children from middle and lower class homes, aged 4 years and 6 months to 6 years. It is clear once more, alas, that as the sentences used to test more and same differed so much in both syntax and sentence length, no real basis for comparing the test results exists. Rothenberg found that 78% of the children from middle class homes could show comprehension of the sentences, Does this bunch have the same number of blocks as this bunch? and Does one bunch have more blocks? whereas only 30% of the children from lower class homes could correctly respond to both sentences. Another 53% of the children from lower class homes, however, showed comprehension of the first sentence only (same), while 9% of the children from middle class homes comprehended the first sentence only. About 5% of each group comprehended the second sentence but not the first, and about 5% comprehended neither.

At first glance it may appear that children from lower class homes simply do not comprehend English comparitives as well as children from middle class homes. The middle class sample was 95% white, however, while the lower class sample was 75% black and 25% Puerto Rican (whose English was "judged" by their teachers as being "adequate"). The differences in the results of the two social classes are partly explicable

in that both the lower class groups speak dialects different from standard American English, and the linguistic devices used for making comparisons differed across the dialects. The following examples from the black urban dialect are illustrative of the differences from the standard dialect (Labov et al., 1968).

1. He can run the same fas' as I can.
2. He is more taller than you.
3. She got the same accent of her mother.
4. When you watchin' a game, you ain't gittin' that much fun than what you would really be playin' it.
5. It ain't that much...people out in Long Island you be around with than it is in New York.

Dialect differences make it almost certain that a test couched in one dialect is not valid for subjects who are not speakers of that dialect (Baratz, 1968).

Donaldson and Balfour (1968), tested 15 British children between the ages of 3 years and 5 months and 4 years and 1 month, and then in a retest 6 months later, found that 14 of the children consistently interpreted less as meaning more. Only discrete (count) items were compared in a variety of different tasks in which the children had to make different kinds of responses. These ranged from making a change ("Make it so that...") to observing and judging a change. The results were consistent in all variations of the tasks, which basically consisted in comparing the number of apples hung on two trees. Although sentences with less proved to be very difficult, those with more were not. Similarly, 9 out of 15 children recognized equality and comprehended the appropriate relational term, same. Some children however, saw no inconsistency in pointing out that while both trees had the same number of apples on them, they also both had more, or one had more! These results suggest that at 4 years and 6 months, many children may not recognize the incompatibility of more, less, and same.

A later study, (Donaldson & Wales, in press) indicates that comprehension of comparatives is strongly related to semantic factors over and above syntactic and lexical features (cf, Lumsden & Poteat, 1968). Donaldson and Wales found that young children could comprehend the comparatives of "positive" adjectives (e.g., more, bigger, longer, thicker) earlier and more correctly than the "negative" adjectives (less, smaller, shorter, thinner).

The results of all these investigations on the comprehension of certain comparative devices are certainly not of the kind that could be used to give advice to grade 1 teachers or the writers of beginning reading and mathematics textbooks. Comparisons with more appear to be easier for children under 6 years than comparisons with same or less, but children of that age probably find all three difficult if long sentences or multiple test questions are used.

In light of the inconclusive results of the studies of comparatives, it would seem particularly worthwhile to investigate the comprehension of comparatives in a variety of linguistic environments, and with older children, in order to determine their relative difficulty and also to discover how long the difficulties noted with younger children persist.

Outline of a Conceptual Category Approach

One of the conclusions to be drawn from the foregoing review of the literature is that claims such as those of Carroll (1960) that children "know" their language by the time they begin school need to be heavily qualified. Further, considering the vast complexity of a human language, perhaps the most disturbing aspect discovered by this review is that the literature on the development of comprehension of English syntax is so limited that it can be reviewed at all. Of the few areas of grammar investigated, it is not even known if they were the most important ones. Many of the investigations have been so cursory that neither the age nor the linguistic area can be considered "covered." Most of the investigations have explored comprehension using short sentences, one syntactic environment, and simple lexicon. In order to approach comprehension more thoroughly, it would seem necessary to investigate particular linguistic devices over a wide range of syntactic and semantic contexts, and to study the interactions of these devices, (e.g., conditional and temporal conjunctions with different verb forms and negation).

Part of the problem in approaching the development of comprehension in terms of syntax is that there are no exhaustive taxonomies of syntactic devices on which a systematic body of research could be carried out. There is also the related problem of the differences between adult and child grammar and whether, for example, a child can be legitimately tested for comprehension of grammatical forms and environments that may or may not be used by his peers.

However, even if descriptively adequate grammars were available, it is doubtful whether an approach to comprehension in terms of syntactic devices could ever be entirely satisfactory because of the difficulty involved in applying such generalized findings to different sentence lengths and specific semantic contexts. Wherever effects of conceptual factors--such as plausibility with negation (Wason, 1965) or reversibility with voice (e.g., Huttenlocher et al., 1968b)--have been studied, they have been found to influence comprehension in ways that go beyond effects of the linguistic characteristics of the sentence. The syntactic approach to comprehension, although it has been the major approach used so far, would seem too general to permit the systematic investigation of effects of conceptual factors.

In light of the paucity of knowledge on the extent of children's comprehension and of problems associated with assessing it using current methodologies, it would seem appropriate to consider whether a fresh approach would be productive. Such an approach would need to fulfill several requirements. Among them would be that it identify process variables affecting comprehension. That is, it would avoid the gross evaluation inherent in use of measures of information gain, while keeping the precision which the consideration of syntax makes possible. It would treat language as structure and not as individual words. Such an approach should reveal not only the extent of children's comprehension of particular devices, but also comprehension of language in situations. That is, children's ability to comprehend language in an operational sense would become apparent. Thus, their ability to comprehend linguistic devices in one situation but not another would be revealed. The current literature suggests that blanket conclusions about comprehension need to be heavily qualified by specifying particular environments in which comprehension occurs.

An approach to the development of comprehension in terms of language use, whether the child can comprehend the linguistic devices used to communicate a conceptual category, would seem to hold promise of fulfilling some of these requirements.

Current linguistic notations and models are not designed to describe many of the child's language capabilities. For example, it is of major importance for developmental psycholinguists and teachers to know at what age children become able to comprehend and produce language to communicate (and manipulate) such temporal concept-categories as duration and relative positions in time, or such relational concept-categories as cause and effect, purpose, or motion. Current approaches referenced to syntax make it possible to test for the child's knowledge of the rules of the language system--a formal system which presumably cuts across all conceptual categories. However, these same approaches make it difficult to deal with the competence of language users in specific situations which have semantic unity. Consider the following two sentences which have a superficial formal similarity and which in certain linguistic models, would be classified as having the same "structure":

1. While X was happening, Y happened.
2. Because X was happening, Y happened.

Semantically, however, Sentence 1 is similar to, if not identical with, a large number of other sentences which no current linguistic model would class as formally related. In such a semantic analysis, Sentence 2 is excluded.

3. X and Y happened at the same time.
4. X and Y happened simultaneously.
5. X and Y coincided.
6. X coincided with Y.
7. At the same time that X was happening, Y occurred.

Some of the linguistic devices used in these and other sentences to express the particular temporal relationship are no doubt more common than the others. In some, (e.g., sentences 1, 3) the relationship is expressed primarily through function words and sentence structure. In other cases (e.g., sentences 4, 5) the relationship appears to be expressed lexically.

The particular linguistic devices used to communicate a concept-category may differ from dialect to dialect. Thus, in standard American English, a child may be expected to comprehend the following sentences:

1. He's always doing that. (Or: He does that all the time)
2. It isn't always her fault.

A child who uses the Black Urban Dialect can be expected to be familiar with slightly different devices to express the same concepts:

1. He be doin' that all the time.
2. It don't be always her fault.

An investigation of the extent of a child's comprehension of the linguistic devices used to express a particular (presumably universal) concept-category can be carried out in the child's own dialect or language, and can thus be "culture fair" in a way which is impossible when one uses a formal syntactic approach.

The basis for a conceptual-category approach to the study of comprehension is a three-level model of the relationship between language and the world (cf, Carroll, 1964b; Neisser, 1966). It is frequently assumed by teachers of language that words "have meanings" which symbolize reality. With a few common concrete nouns and verbs, such a view seems to hold. Thus, it may seem that table, tree and run are labels of phenomena in the world. However, put more technically, these words label concepts, which are cognitive classifying constructs formed on the basis of perceptual experience (or by definition). Humans learn to classify experience and to label the classifications rather than the referents. The need for a three-stage model which distinguishes between referents, concepts, and labels becomes clear when a word such as enough is considered. The word labels a concept which is formed after many experiences of "enoughness." In English that concept is labeled with such words as enough, adequate, not too much, sufficient, just right, the right amount, (we) don't need any more, and many others.

This approach to semantics is reflected in the most influential of current linguistic models of the structure of a semantic theory, that of Katz and Fodor (1963). While the theory, which observes Quine's distinction between meaning and reference, has not gone unchallenged (cf, Bollinger, 1965; Weinreich, 1966), the theory does have the advantage of being consistent with current generative theories of language and with theories of cognition (cf, Neisser, 1966), and in part as in the tradition of Kant's view of man and the world.

In the theory of Katz and Fodor, the meaning of words and sentences is derived from complex matrices of lexical "features" (e.g., ± animate; ± human; ± count), and relations defined by the base of the grammar. These rules and features are seen as tagging "the processes by which the species deals cognitively with its environment" (Lenneberg, 1967, p. 334). This view is consistent with that of Vygotsky (1962). In the Katz and Fodor theory there is a clear distinction between two separate aspects of learning to comprehend language. One aspect concerns the formation of concepts; the second, the learning of the linguistic representation of the conceptual structure. As Jakobovits (1968, p. 93) puts it,

> meaning becomes a purely cognitive concept...and semantics represents the linguistic expression of these cognitive operations. The problem of the development of meaning becomes the problem of cognitive development, which is to say that the dimension of meaning--how the human species categorizes and differentiates the universe--antedate the dimensions of semantics--how cognitive categories and relations find expression in linguistic terms. An adequate theory of meaning must be able to characterize the nature of this relation, namely the mapping of the cognitive to linguistic processes...It follows that an adequate theory of semantics must concern itself not only with the vocabulary of a language and the relation between words and things (reference), but also with the manner in which the semantic component of a language allows the expression of cognitive relations (meaning).

Such an approach to meaning and the comprehension of language implies no causal relation between language and concepts in the sense that Sapir (1921) and Whorf (1956) outlined. The Whorfian hypothesis of "linguistic relativity"--that the language one learns to speak forms a grid in terms of that the external world is perceived--is rarely held in its strong form today. Nor, on the other hand, does this approach support the diametrically opposed strong Piagetian position which maintains that language is merely a reflection, rather than a determinant, of thinking. The approach outlined by Jakobovits above has very far-reaching and as yet unattained goals. Neither cognitive nor linguistic processes are well understood at present. A conceptual category approach to the study of language comprehension is merely a first attempt to take account of the relationship between formal linguistic processes and cognitive relations, by showing how well language is comprehended in specific language use situations.

A further presupposition of the model of Katz and Fodor is that a semantic theory has a universal base. Katz (1967) writes,

> ...since the semantic markers utilized in the construction of dictionary entries for particular linguistic descriptions will be drawn from a universal vocabulary, the vocabulary offers a language-independent means of representing the common conceptual system underlying communication in natural languages...Semantic markers must therefore be thought of as theoretical constructs introduced into semantic theory to designate language invariant, but language-linked components of a conceptual system that is part of the cognitive structure of the human mind.

Acceptance of the Aristotelian-Kantian view does not mean that Katz is arguing that the concepts humans use are innate. Rather, he is arguing that the concepts which are formed on the basis of perceptual experience fall naturally into "categories" e.g., categories of space, time, and quantity.

Elsewhere Katz (1966, p. 224-279) argues that his lexical feature theory can both accomodate the theories of Aristotle, Kant and others, that fundamental conceptual categories exist, and also can be used to check whether a proposed set of categories "is both correct and exhaustive." Such a role for lexical feature theory will depend on whether current very sketchy outlines can be developed further.

Thus, Katz and Fodor clearly intend their model of the semantic component of language to be concept-related, and not to be related directly to objects and events and processes of "the real world." Conceptual behavior is recognized as the pivotal intermediary between language and the world. The theory recognizes further that the study of how, and how well, a person understands a sentence is intimately related to his understanding and utilization of concepts. Carroll (1964b) has suggested that difficulties which language learners have in using language to express and understand thought may be due to "their inadequate mastery of prerequisite concepts."

Roger Brown (1956) has similarly described this relationship--

> correct speech means more than correct pronunciation. It means the properly selective use of meaningful units. One cannot speak a language until one has formed the governing non-linguistic concepts...

Brown adds that language, once acquired, is able to facilitate the acquisition of further concepts, but it is worth recalling the observation of the English philosopher, Ayer (1947), who said that, "We interpret one

symbol by another, but it is only because the circle is broken by our actual experiences that any descriptive symbol comes to be understood." Carroll (1963) calls the selection of language symbols to match subjectively perceived events "encoding" and concludes that a person who is learning a language (first or foreign) must be taught to observe and encode experience "as nearly as possible in the same way as native speakers of that language." Ohman (1953) illustrates this in a comment on the difficulty encountered using foreign units of measurement even when the linguistic symbols are known.

However, it is not enough to suggest that if a language learner is to use that language successfully to communicate, then he must have concepts as well as the language symbols to express these concepts. An obvious task is to attempt to identify these concepts and the linguistic devices which carry them in a given language. Sapir (1921, p. 39) wrote, "...on the whole it must be admitted that ideation reigns supreme in language, that volition and emotion come in as distinctly secondary factors. This after all is perfectly intelligible. The world of image and concept, the endless and ever-shifting picture of objective reality is the unavoidable subject of human communication."

There have been numerous attempts to categorize the concepts to which Sapir refers. Aristotle ("The Categories") suggested ten such concept-categories: Substance, Place, Time, Relation, Quantity, Quality, Position, State, Action, Affection. This list was almost certainly not intended to be exhaustive (cf, Dineen, 1967, p. 85).

In addition to his a priori "forms" of space and time, Kant outlined a set of twelve conceptual categories, which he subdivided into four groups (cf, Russell, 1945):

1. Quantity: Unity, Plurality, Totality.
2. Quality: Reality, Negation, Limitation.
3. Relation: Substance-and-Accidence, Cause-and-Effect, Reciprocity.
4. Modality: Possibility, Existence, Necessity.

At a conference called to examine the Sapir-Whorf Hypothesis of linguistic relativity one of the participants, Milton Singer, suggested (Hoijer, 1954, p. 210) that it was not the concept-categories which were difficult to define, but rather their importance relative to each other. "I will not argue about the definition of a 'conceptual category'. On the common sense level, I think we all know what it means. Take a category as 'time'; obviously time is handled in the morphology of a language in different ways in different languages...To stay at the grammatical level is obviously not enough. But suppose we ask the question: How many and what kind of time words are there?"

Singer refers to time as a common sense conceptual category. Other writers have suggested that there is indeed a hierarchy of categories. Flavell (1963), referring to the kinds of categories Piaget has explored as "these grand and fundamental categories of experience," lists such

categories as Number, Space, Time, Classes, and Relation. Inhelder (1962) refers to them as "the categories and concepts of established science." Carroll (1964a) suggests that there are certain prior concept categories which are usually encoded linguistically, and which play a major part in cognition. He lists these examples--identity, similarity, comparison of magnitudes, spatial position, temporal sequences, causation. Pittman (1957, 1960) suggests that "these ideas are at the root of all technical training, elementary and advanced," that is, description and definition, measurement, degree and proportion, and development and processes. He has further noted (1961) that the relational concepts of comparison, possibility, measurement, and space seem particularly difficult as a second language for South Pacific students of English.

An attractive proposal has recently been made by Garvin, Brewer and Mathiot (1967), who suggested semantic analysis in terms of "Predication-Typing." Basically, their approach analyzes linguistic devices in terms of the semantic role that the devices play, rather than according to fundamental categories. Among many examples, they include the following:

Examples

Statement of Sequence	(A is followed by B)
Statement of Description	(A has a property of B)
Statement of Relative Location	(A is located relative to B)
Statement of Source	(A comes from B)
Statement of Explanation	(A is accounted for by B)

This approach has the merit of accounting for each device on its own terms without resorting to preestablished "pigeon-holes." Presumably a set of categories would be established inductively from a huge corpus of sentences, the "predication-typing: process resulting in certain devices being included together to form discernible categories."

Although there does seem to be a kind of consensus that certain conceptual categories are more basic than others, all this is suggestive rather than comprehensively taxonomic. We do not yet know how to delimit such categories systematically, let alone measure their relative importance in a particular field. We cannot even assume, as Singer apparently did, that we already know what the concept categories are. At present, apart from the approach of Garvin et al., the best source of information is probably that provided by lexicographers. Roget's Thesaurus of English Words and Phrases was first published over a century ago. It was organized according to conceptual categories rather than the standard principles of alphabetization. More recently at the Seventh International Congress of Linguists meeting in 1952, it was considered relevant to include a whole section of the Congress on the topic of concept dictionaries. Mezger, (Proceedings, 1952, p. 84), outlined a basis for a dictionary of concept-categories. His major categories in a sub-section on Man and the World include: Existence and Relation, Time, Space, Area, Position, Shape, Form, Quantity, Size, Degree, Number, and Motion.

More detailed lists of conceptual categories have been published by Dornseiff (1959) and Hallig and Von Wartburg (1952) as the basis for concept dictionaries of the German and French languages respectively. These were attempts to set up frames, and do not indicate the kinds of semantic relations existing among concepts.

Singer (Hoijer, 1954, p. 213) raises an obvious question regarding the scientific description of conceptual categories "...Should we not develop some fairly precise technique to describe linguistically how a language deals with a category, not only in grammar, not only in lexicon, but in all the ways the language as an instrument provides?" He suggests that it would be pertinent to make a contrastive analysis of the ways different languages deal with such categories. However, Prator (1963) has noted the very real problem involved in extending the contrastive analysis of languages beyond the phonological level. "What is vocabulary in one language may be grammar in another."

The potential use and some of the problems of a conceptual-category approach to language use can be illustrated by an examination of the kind of language that educated, but not necessarily specialist, users of English meet frequently in newspapers, reports, or the evening TV news. The following paragraph illustrates the importance of the category of motion. In order to comprehend the paragraph, it is necessary to comprehend a wide variety of linguistic devices, both syntactic and lexical, which carry the concepts of physical motion:

> Though production generally advanced in 1961, the year was not noticeable for the vigor of its upward thrust. Recovery from the recession in North America got under way towards the end of the first quarter of 1961, but this did not raise output for the year as a whole much above the level of 1960. In W. Europe and Japan, the upswing in economic activity which had begun in 1958, paused temporarily in the course of 1961 and the rate of increase for the year as a whole was considerably below that of a year earlier. In face of the mixed trends in industrial countries, exports of the primary producing countries rose only moderately while prices of primary commodities entering international trade underwent a further decline. In most of the centrally-planned economies, though total output continued to increase at a high rate, the pace of advance slackened; industrial output rose at a somewhat slower rate while agricultural production either fell absolutely, or increased only slightly, owing mainly to adverse weather conditions. In mainland China, agricultural production, which had fallen substantially in 1960, failed to recover to any significant degree in 1961; largely because of the agricultural situation, industrial expansion was also brought to a halt. (World Economic Survey, 1961. United Nations, 1962, p. 3).

An underlying premise of this paper is that a conceptual-category approach to the study of language comprehension in language use situations makes it possible to evaluate joint effects of lexical and syntactic devices, something that cannot be done when these devices are studied in isolation. This approach permits the investigation of comprehension in terms of behaviorally-stated objectives and is of particular significance for the study of children's comprehension. That is, if it is established that it is important for children to be able to comprehend the linguistic devices used to comprehend positions in space or temporal duration, a taxonomy of such devices can be prepared as the behavioral objectives of instruction and children can be tested for comprehension. As has been noted, this enables formally-diverse but semantically-similar devices to be investigated together with the semantic goal in mind. This is difficult, if not impossible, to achieve within a framework of isolated syntactic or vocabulary studies because while the former cut across many semantic and language use categories, the latter ignore language as structure and do not treat synonymous syntactic and lexical devices together.

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